

Original Lectures.

ON THE PLANS FOR THE JOHNS HOPKINS HOSPITAL AT BALTIMORE.

A LECTURE GIVEN TO THE MEDICAL PROFESSION OF BALTIMORE, FEBRUARY 5, 1877.

By J. S. BILLINGS, M.D.,
SURGEON UNITED STATES ARMY.

PART I.

GENTLEMEN:—Before a final decision was made on the plans for the Johns Hopkins Hospital, prepared and submitted to the trustees last year, it was thought desirable that they should be compared with the most recent plans for similar institutions in Europe, and that opinions and criticisms upon them should be obtained from those who have given most attention to such subjects abroad as well as at home.

For this purpose, and also for others connected with my duties at Washington, having obtained a leave of absence, I landed at Queenstown, October 16th, and re-embarked from Liverpool, December 16th, having during the sixty days of interval visited the principal cities in Great Britain and Western Europe, and having at each place examined the hospitals and medical schools, and conferred with those most interested in such matters, so far as the very limited time at my disposal would permit. On my return I presented briefly the results of my observations and inquiries to the trustees, and it has been thought that a part of this statement might be of interest to the medical profession in this city, hence I propose to-night to speak of the hospital and its plans more especially from a professional point of view. I do not propose to go into details as to what I saw and heard in Europe, but merely to state general conclusions. I may say, however, that I was everywhere received with the greatest kindness and hospitality, and every facility was given me to see what I wished to see,—that I found the Johns Hopkins trusts well known by name everywhere, and that much interest and curiosity is felt by medical men there as well as here as to the course which is to be taken by this medical school and hospital.

One of the objects of my visit had reference to the extension and improvement of the National Medical Library at Washington, and a comparison of its resources and mode of management with those of some of the celebrated collections of Europe. I find that in point of size this is one of the largest separate medical libraries in the world, the largest ones in Europe being those of the Royal College of Surgeons, and of the Royal Medico-Chirurgical Society of London, of the Royal College of Physicians in Edinburgh, and of the Medical Department of the Prussian Army at the Friedrich Wilhelm Institut at Berlin, which last is under the charge of an army surgeon, Dr. Sachse, and is one of the most valuable and best arranged on the continent.

With reference to the subject of medical education, and the views which I have elsewhere expressed as to the relations which should exist between the hospital and the medical department of the university, I find that I am in accord with all or nearly all of those whose opinions on this matter I was able to obtain. These views may be stated as follows:

The ideal medical student for this university should be a graduate in arts, and should have taken a special course during the last one or two years of his academic career. He should then spend two years in the study

of the theoretical branches and in work in the dissecting room and laboratories. The next year, while continuing these studies, he should begin clinical work in the dispensary, and be shown certain cases in the hospital. The fourth and last year he should devote entirely to the study of disease, and for this purpose he should reside in the hospital. Having completed this course and graduated, the post of resident physician for another year is open to his competition, or he can take a special course suited to make him an expert in state or preventive medicine. A student from another school should be allowed to take that place in the course which proper tests show him to be fitted for, and the idle or incompetent should be unsparingly thrown out by a series of successive examinations. As the graduating class is to reside and be employed in the hospital, its number must be limited by the plan of construction, and the number I have selected is twenty-five.

Thus far I have considered the question as if the object of this hospital, so far as it is to be a part of the medical school, were to allow the students to become acquainted with the forms and accepted modes of treatment of various diseases in order that they may recognize and similarly treat them when met in their practice, thus doing merely what other hospitals connected in like manner do, only perhaps a little better and more thoroughly than is usual. But is it not also possible that in this hospital every instrument of precision and means of investigation known to the physicist, the chemist, and the physiologist, may be applied to increase our knowledge of disease and of the action of remedies, by or under the supervision of men specially trained to observe, accurately record, and scientifically deduce from such records new points for inquiry, and new means of making such inquiries, and so on in a sort of arithmetical progression? Here and there in the world there are a few men engaged in such researches, but they are few and widely scattered; those who have the means usually have not the time, and those who have the time have not the means. It requires, moreover, something more than time and means to make valuable observations in so difficult a science as medicine; to get the best results, the observer must have, besides natural ability, a special training. In short, I would have in this hospital the professors and lecturers and students all to be seekers and learners together, each in his own place, and if twenty-five, or ten, or even only three such graduates as I would have them, can be produced each year, it will repay the effort. They will be fitted to be general practitioners no doubt, but they will also be fitted to undertake special work which the average graduate would not dream of attempting.

I do not find that those physicians whom I have consulted at home and abroad think that this is aiming too high; at all events, no harm can come of trying. If there are any young men in this country able and willing to do such work as I have indicated, let us give them the opportunity to do it; if there are none, we shall not be worse off than other hospitals, at all events. I am not aware that there is at present any urgent demand either by the medical profession or the public for more doctors, certainly not for more than the institutions at present engaged in manufacturing them are able to supply; but there does seem to be a demand among the leading thinkers among our physicians, for some men fitted to be investigators and discoverers.

Two objections have been made to this plan. The first is offered by some American physicians, who fear that the requirements are so great and the course of

study so long, that there will be very few students—too few, in fact, to warrant the keeping up of a proper staff of teachers.

They think, however, that the experiment is worth trying; and from what I know of the number of American medical students who yearly go abroad, I have little doubt that if Baltimore give the means for such a post-graduate course, as I am sure can be organized here, there will be no lack of candidates.

Such a medical school, it is evident, is not in antagonism to existing medical schools; it has a different purpose, and its means of fulfilling it must also differ.

The second objection made is, that the number to which the graduating class is limited is too small; that there will be many medical students who will wish to avail themselves of the special advantages of this university, and that it is bad policy to exclude any.

To this I would say, let the best man win; twenty-five students are probably as many as can be trained to the best advantage in this hospital, and what should be aimed at is quality not quantity. Some German physicians think that the course of medical instruction should occupy six or seven years, as in the new school at Geneva, or as in Sweden, taking the ground that the graduate should be master of all the resources of his art.

Without attempting to fix the precise time to be occupied in study, since some will learn as much in three years as others will in six, it does not appear to me that the purpose of this school should be to turn out finished physicians, so much as to fit men for study and investigation by themselves. For instance, I think it highly desirable that a young man intending to be a physician should learn enough of the art of drawing, to enable him to note distinctly any peculiarity of form of the body, or of its organs; and if he can copy shades of color, so much the better; in part because he thus learns also to observe closely and accurately, in part because it is a powerful aid to his memory, and as a means of explanation; but I do not think it necessary that he shall be qualified to lecture *ex cathedra*, and without previous preparation, upon any medical subject selected at random, in the style that would be expected of an experienced professor.

With regard to the various medical schools which I saw, I shall here say but little, proposing to take up this subject in detail at another time. I may, however, refer to one which must always have an interest to American physicians, since it is the one which served as the model for our own, having been a century ago the most celebrated school in Europe, to which resorted those of our young men who, on their return, became the medical teachers and leaders of the New World; I mean, of course, the Medical Department of the University of Edinburgh.

This still has much the largest classes of any medical school in Great Britain, and there are several causes for this. Of these, an important one, and the one upon which most stress is laid by the Edinburgh men themselves, is the peculiar system of what are called extra-mural lectures which prevails there.

Any man who can pass a moderately severe examination, and is accepted by the University authorities, may lecture on any one subject in the medical curriculum that he chooses, and his certificate that the student has attended his lectures is of equal value before the examining board with that of the professor. He must charge the same fees that the professor does, and the students can only take a certain proportion of their tickets from the extra-mural teachers.

It might be supposed that as the professor is the examiner he would have the advantage, but impartiality is secured by placing on the examining board men who are not professors, and who are sometimes extra-mural teachers.

To obtain the degree of Bachelor of Medicine or Master in Surgery, the candidate must have studied these subjects for four years, and must have a good general education as tested by examination, or by the presentation of evidence that he is a graduate in arts. The degree of Doctor of Medicine is given two years later.

It will be perceived that a set of young professors in the shape of the extra-mural lecturers are continually in training, and that the professor himself is constantly stimulated to do his best, since he cannot fall into an easy-going jog-trot routine without soon suffering from the competition of his rivals, over whom he has some advantages, it is true, but by no means enough to enable him to rely solely upon them to retain his pupils.

In the larger medical schools of France and Germany, it seemed to me that the great clinical advantages which they present form their chief recommendation, and that the best results can only be obtained by those who go there with a very considerable stock of preliminary knowledge.

In the laboratories, physiological and pathological, of the German schools, there is for those who are fitting themselves to be general practitioners, rather too much of a forcing process in the stimulating to and requiring of some one piece of original work, instead of trying to make a man fit to undertake any original work that may present itself.

The student is led to think that his highest object should be to perform some experiment or make some observation which has never been done before, and for this purpose he may work a year in the laboratory and yet acquire but a tithe of the knowledge he went there to obtain. As a rule, it seems better that such special researches should follow and not precede general culture; if the foundation is narrow, the superstructure cannot be wide and firm.

Of buildings devoted to medical schools, I was much pleased with those at Manchester and Liverpool. Those at the latter place are all of one story, giving fine facilities for light and ventilation.

The arrangements of those at the Owens College in Manchester are also good, but they are too far from the hospital, and when there is space available, it seems to me that laboratories and lecture-rooms had better be in one-story buildings.

With regard to the vexed question of hospital construction, it seems that the majority of those who have given especial attention to this subject, prefer wards of one story, especially for surgical and obstetrical cases, and favor isolation and separation of the several buildings.

I have not found it possible to obtain positive reliable data as to the effects of various plans of existing hospitals upon the health of the inmates, except in a few special and aggravated cases. As a rule, each person thinks the system with which he is most familiar is the best; one may try to go behind the dogmatic assertions and find out upon what they are founded, but the result is negative.

Mortality statistics are of little use for this purpose, since the character of cases received varies so much. I tried at first to get the statistics of certain classes of cases, such as compound fractures and dislocations, and outbreaks of erysipelas and septicæmia—or of diseases arising among the hospital employees; but I

was soon convinced that these depend far more on methods of management and treatment, on the preservation of cleanliness, and on care in the use of antiseptics and disinfectants, than on the plan of the hospital; and that where what is known as "Lister's method," is regularly and methodically employed in the hospital, its healthfulness cannot be estimated by the statistics of the surgical wards.

I was acquainted with Mr. Lister's teachings before visiting Europe, and assented to them in a theoretical sort of a way; but at the same time I looked upon the antiseptic method as being the latest fashion, and therefore probably overpraised. But after learning the results of its employment in the hospitals at Bonn, Leipzig, Berlin, and in certain wards in London, and especially after an examination of Mr. Lister's wards in the Royal Infirmary at Edinburgh, and seeing the cases dressed in all stages after operations—operations such as opening the knee-joint, or upon abscesses of spinal origin—I came to the conclusion that this method is the most important contribution to our resources in surgery which has been made since the discovery of anaesthesia. Not that the details of the method are perfected, for probably much may yet be done to simplify it, and we may perhaps discover a better material for the purpose than carbolic acid: but we now may be said to know positively, instead of merely conjecturing, that the process of putrefaction is due to minute solid or semi-solid particles floating in the air, and that Mr. Lister has devised a method by which these particles can either be kept out of a wound made by the surgeon, or by which they will have their power of producing the putrefactive change destroyed, is, I think, beyond doubt.

The fact that the various changes in organic matter which we know as fermentations, putrefaction, etc., are due to minute organisms, which organisms are not spontaneously developed, but arise from similar organisms only, is one of great importance in hospital management.

Perhaps you are not all familiar with the exceedingly careful, minute, and laborious researches which Mr. Lister has made on this subject of the germ theory, and the development of bacteria, and I would therefore call your special attention to papers published by him in the *Transactions of the Royal Society of Edinburgh* for 1875, and the *Microscopical Journal* for 1878. I had the opportunity of examining his specimens and apparatus, including some of which he has not yet published a description, and from these, from the clinical results obtained by him and by those who have properly used his methods, and from the researches of Dr. Burdon Sanderson on Contagion, and of Tyndall and others on Dust, I think it may be considered as certain that the dangerous thing in a hospital is a dust, an excessively fine, organic dust, which is almost omnipresent, which is in the air, the bedding, the hair, and the clothes of all occupants of the buildings, and the particles of which are so minute, and have so low a specific gravity, that their rate of fall through the air when it is perfectly still, may not exceed two inches per hour.

Some of these particles are living organisms, spores of fungi, bacteria, microzymes, of various kinds, some vegetable, others animal in character.

These living organisms when first produced, and in a state of activity, are more or less gelatinous in consistence, and will adhere to any surface with which they come in contact. While in this condition, they are not found in the air to any great extent, but exist in fluids, discharges, and moist places. In this condition they can be filtered out from the fluids which

contain them, and these fluids thus filtered, lose their specifically dangerous qualities. They soon dry—at least on the surface, and in this condition lose their adhesiveness, and are easily detached and carried about by currents of air. To enable them to develop and multiply and reproduce their kind, which they sometimes do with amazing rapidity, there is necessary the presence of moisture and of organic matter. For our purposes, we may divide these living organisms or microzymes into two classes.

The first includes the ordinary forms which are found everywhere, and which are the efficient causes of mould and mildews, and of fermentations and putrefactions. Under ordinary circumstances we know that these are not dangerous. We can hardly draw a breath without inhaling them; we cannot take food, or water, or milk, without swallowing them. It is believed by Mr. Lister that healthy living tissues are capable of preventing the development of these low organisms in their immediate vicinity.

This is perhaps doubtful, unless by immediate vicinity is meant actual contact, but it is certain that unhealthy tissues and fluids in the body may favor their development. In these unhealthy tissues, these common forms appear sometimes to acquire new and specific powers by successive development, so that it is possible to produce from common harmless forms, by successive inoculations, other forms which act as specific morbid poisons in a healthy organism.

The second class of microzymes includes those which are not everywhere present, but for the most part arise only in diseased men and animals, and appear to have the power of producing diseased action even in perfectly healthy tissues. These constitute what is called contagium, and are what we have in mind when we speak of the germ theory of disease.

All problems of isolation and disinfection in a hospital have reference to these contagia only, for there is no isolation or disinfection which will rid us of the microzymes of the first class.

The vitality of these germ is destroyed by a dry heat of 240° F. continued for three hours, and upon this fact is based the principle of the disinfecting ovens and stoves, which are coming more and more into use in Europe, and especially in Great Britain. A careful series of experiments on this subject has been made under the supervision of the medical officers of the local Government Board, with the result of especially approving a form in which the heating is effected by gas, and the products of combustion are allowed to pass into the heated chamber. The results which have been obtained from the use of these ovens in Great Britain, and by the methods of disinfection employed under the direction of the Boards of Health of New York and New Orleans, fully warrant the conclusion that we can destroy these minute germs in clothing, in bedding, and in habitations. Besides these microzymes we have also, in a hospital ward, other particles of organic matter, not living, derived from the surfaces of the skin and mucous membranes, and especially from the mouth and air-passages during respiration, which are important as furnishing nutriment and means of development to the microzymes above mentioned.

Perhaps, although with our present knowledge we can hardly say that it is probable, we may also have in the ward certain complex vapors or gases of organic origin which are dangerous. It rarely occurs that in any ward there are enough of the known poisonous gases, such as sulphuretted hydrogen and carbonic oxide, to produce poisonous effects, and I presume that I need hardly assure you that that great bugbear,

carbonic acid, about which popular lecturers on ventilation discourse so learnedly, is never a dangerous impurity in a hospital. I saw, however, two hospitals in Europe where openings had been made from the ward to the external air at the level of the floor, in order "to let the heavy gases, and particularly carbonic acid gas, run off." As there are no heavy gases near the floor in any greater proportion than there are at the ceiling, it is clear that the result desired could not be obtained.

It is curious to note how widely spread are the fallacies that carbonic acid is the dangerous impurity to be got rid of by ventilation; and that as it is heavier than ordinary air, it will sink towards the floor and be found there in increased proportion. These fallacies are usually urged by those who advocate a downward system of ventilation; the law of the diffusion of gases, and the actual effects of carbonic acid on the animal system being apparently unknown to them. The question assumes a different aspect when we know that the dangerous impurity is particulate or a dust. This is slightly heavier than the air, but settles very slowly, and is carried up by very feeble currents. Probably, however, it will be found in greatest quantity near the floor; but the difference is not very great.

In a hospital ward properly managed, the object, so far as purity of the air is concerned, should be as follows: First, to prevent the development of any of the contagious germs in the ward by not admitting to it patients whom we have reason to believe are producing them; or, where this is impossible, by destroying their vitality while yet in the moist condition.

This involves isolation, and the methodical use of antiseptics and disinfectants in connection with all excreta and discharges. It also involves keeping the wards, floors, and walls as dry as possible. New hospital wards in brick buildings are very apt to be unhealthy, and this seems to be due to excess of moisture in the walls. When the new building for the Royal Southern Hospital at Liverpool was occupied by patients, the results for the first year or two were not as good in the fine airy pavilion wards, in which each man had 2,000 cubic feet of air space, as they had been in the old crowded building which had been previously occupied. Erysipelas and other hospital diseases appeared; and not until the thousands of gallons of water, which the new bricks and mortar contained, were removed by the slow process of evaporation, did the building become a healthy one.

The second object in hospital management is the removal of all dust which has settled or lodged, and that this shall be a real removal, and not a mere scattering of it from one place to allow it to settle elsewhere. If, for instance, dust is removed with a damp cloth, this damp cloth becomes a dangerous thing in itself. If the external air be cold, we may have a precipitation of moisture on the glass of the windows, and in this moisture will be a considerable proportion of organic matter, so much that if it be collected the fluid will give decided signs of putrefaction.

Now this precipitation of moisture and organic matter is temporarily a purifying process; but if the windows be allowed to dry of themselves, we have, then, a store of dangerous dust, on and at the bottom of the panes, which must be taken care of. I might go on in like manner with many other details, but I have said enough to show what is required.

I came back more thoroughly impressed and convinced than ever, that the thing of prime importance in a hospital, is minute care of, and cleanliness in, every part and person about it, and in the management

which will insure this; while without it the most perfect structure that can be devised, soon deteriorates, and gives only second or third rate results. It was very interesting to observe how, in some of the older hospitals, such as the Rotunda in Dublin, Guy's and St. Bartholomew's in London, the City Hospitals in Bonn, in Leipzig, and in part of the Charité in Berlin, the defects of construction and plan were compensated by the mode of management; while, on the other hand, in hospitals admitted to be much superior in plan, such as the Lariboisière, St. Thomas's, and the Herbert, in which it had been apparently supposed that they were so perfect that it did not matter how they were managed, the results are by no means so satisfactory.

The third point in ward management is ventilation; and with regard to this, I am sorry to say that I was able to obtain but little positive information as to the relative economy of the various methods—which is, after all, the main question in dispute.

There, as here, opinions for which no precise data could be given, were abundant; but when I asked how much fresh air is introduced into this ward in an hour? how well it is distributed? and how much does it cost? it was only in two or three hospitals that I could get any definite answers.

The data obtained from English hospitals are of little use to us in this country, owing to the marked difference in climate. Even in England, large wards are not, as a rule, sufficiently heated to make the patients comfortable; and I found that various methods were being tried to supplement the open fire-places, which are not satisfactory, and yet whose efficacy it is considered almost criminal to doubt. Open windows, and various valves and contrivances to throw the incoming cold air upwards are employed; and of these, if open fire-places are to be the sole means of heat and ventilation, and the incoming air is not to be warmed, I think that what are called Tobin's tubes are the best. A modification of this principle is used in the new wards in the London Hospital, in which the fresh air is taken in through slits in the window sills, and this mode is also employed in the new New York Hospital, but the air is warmed before admission.

In the latest and best of the German hospitals, the principle has been adopted of making the heating and ventilation of each building independent of every other. The results, as I observed them, were good, but the arrangements are complicated and expensive, and require careful superintendence. The principal authorities whom I consulted, prefer systems of aspiration to those of impulsion, but are of the opinion that although it may be theoretically possible to effect ventilation of an extensive and scattered series of building by means of one great aspirating chimney, yet that the practical difficulties in the way of adjustment of ducts and apertures to secure in all parts the flow of air desired, will be so great, that it will not be prudent to attempt it.

There is a general feeling of timidity about attempting to use large and powerful but complex systems, which is due to sad experience of failures of such, and hence the recommendation to heat and ventilate each building by itself, or, in other words, to give up the problem of concentration and simplification of the apparatus as unsolvable.

I found the fan or impulsion system in use with good results in the Grand Opera House in Vienna, with medium results in the Chamber of Deputies at Versailles, and with poor result in the Gynæcological Hospital at Bonn, and in the "Lariboisière" and "Necker" in Paris.

Where it was a failure, it was easy to see that the

Original Lectures.

ON THE PLANS FOR THE JOHNS HOPKINS HOSPITAL AT BALTIMORE.

A LECTURE GIVEN TO THE MEDICAL PROFESSION OF BALTIMORE, FEBRUARY 5, 1877.

By J. S. BILLINGS, M.D.,

SURGEON UNITED STATES ARMY.

PART II.

We will now pass in rapid review the plans of a few existing hospitals, before showing the one proposed for the Hopkins Hospital.*

The first is that of the great hospital at Milan, the Maggiore, which in the last century was considered a model, and which can contain over 3,000 patients. The principal wards form two crosses, one on either side of a central yard; they are over 30 feet high, with vaulted ceilings, brick floors, and windows, the sills of which are about 15 feet above the floor, being placed above corridors on either side.

There is no heating apparatus; small iron stoves were used at the time I was there, the pipe projecting from a window. One wing of the cross was unoccupied and was being cleansed and purified; this, I was told, is done in regular rotation in each wing. The air in the main wards was pure; in the other, or corridor wards, it was offensive. I saw nowhere a prettier sight than was presented by the children's ward in this hospital, and nowhere a sadder one than the ward for inevitably fatal cases, in which are collected cases of cancer, etc., and to be moved into which may be taken as a death warrant.

The next plan which I show you is that of the celebrated Lariboisière, at Paris, with which I have no doubt you are all familiar, as it was the first hospital methodically constructed on the pavilion plan. The ventilating apparatus for this hospital has not proved satisfactory, for the reason that the flues and openings are too small, and the power applied insufficient. The next is that of the new City Hospital at Berlin, the Friedrichshain, the plans of which were prepared in accordance with the advice of Dr. Esse and Professor Virchow, and which may be considered as the most recent attempt in Germany to obtain perfection in a hospital, regardless of expense. The plot of ground occupied is situated in the suburbs of the city, and measures about 900 by 1,200 feet, containing 23½ acres.

The buildings consist of six two-story pavilions, four of one story, and two for isolating purposes, with an administration building, a kitchen and laundry, a mortuary, a bath-house and a nurse's home, and these buildings are entirely isolated from each other, being scattered over the entire lot and having no connecting corridors, but merely uncovered asphalt walks. The distance from the kitchen to the farthest ward is about 900 feet; and the day I was there, which was a cold one with snow on the ground, I saw the female employees bare-headed and bare-armed, carrying the food to the wards under circumstances which would certainly cause great complaint in this country. I could not learn, however, that lung diseases or catarrhs were specially prevalent among those thus exposed. The pavilions are built of brick and are handsomely finished, with tiled floors in the surgical wards. No clinics

are held in this hospital, nor are students admitted. The total cost was 4,520,789 marks, or about \$1,200,000; equal in this country to about \$3,000 per bed.

The next plan is that of the Rudolph's Hospital in Vienna, which is the most recent large hospital in that city. This is on the corridor plan—the buildings being three stories high, and arranged around a central garden. The heating and ventilation are effected by large stoves of a peculiar kind, and the results are good, which is due largely to the careful superintendence of Professor Boehm, the manager of the hospital, who devised this method. Professor Boehm has made a special study of this subject of ventilation, and has arranged the apparatus for that purpose in the new Grand Opera-House at Vienna, which I had the pleasure of examining in his company. The arrangements are exceedingly complicated, more so than any I have ever seen, unless it be in the new Houses of Parliament in London. The system is one of combined impulsion by a fan and aspiration by means of gas jets, and the result is success, which, however, could only occur with skilled and careful management.

The next plan is that of the Jacobs, or City Hospital, in Leipzig. Here the pavilions are all one story, with ridge ventilation, connected by a corridor, and heated by large German porcelain stoves in the wards. It is difficult to obtain sufficient warmth in very cold days in winter, and in still warm days in summer there is very little movement of air.

The next plan is that of the new hospital at Wiesbaden, in which the pavilions are placed in echelon on the sides of a triangular plot of ground with the Administration building at the apex.

With the plans of the principal English hospitals, such as St. Thomas and the Herbert, I presume that you are sufficiently familiar. I regret that the plan of the new Royal Infirmary at Edinburgh has not yet come to hand. This hospital is now in process of construction, and will, when completed, be one of the finest buildings of this kind in Great Britain, if the heating arrangements prove sufficient. It consists of two rows of two-story pavilions, connected by an H-shaped corridor somewhat on the plan of the old Satterlee Hospital in West Philadelphia. We will now look at the arrangements of the ward in one or two of these hospitals.

The first is of one of the Leipzig hospital wards. In this there is a large sun or day room at the farthest end of the ward, and the service-rooms are next the corridor, in fact, actually in the ward itself; yet there is no unpleasant smell, owing to the regular and frequent use of disinfectants.

The next is the plan of one of the one-story surgical wards of the Friedrichshain Hospital. The heating is by hot water; the warm fresh air is brought in the middle of the ward to the top of a sort of table covered with wire netting, and is taken out through registers placed at the side near the floor, being drawn downwards into a duct which passes into an aspirating chimney. This chimney is driven in part by the waste heat from the furnace which effects the heating, and in part by a separate furnace intended exclusively for this purpose. The arrangements of valves and ducts is a complicated one, and should have skilled supervision to produce the best results. The consumption of coal for each pavilion is about 1800 pounds per day. In this as in all European hospitals the patients dine in the ward, but a day-room is provided for those who are able to leave their beds, and this is separated from the ward by the large chimney which rises in the centre.

* The plans referred to were shown on a screen by means of a magic lantern.

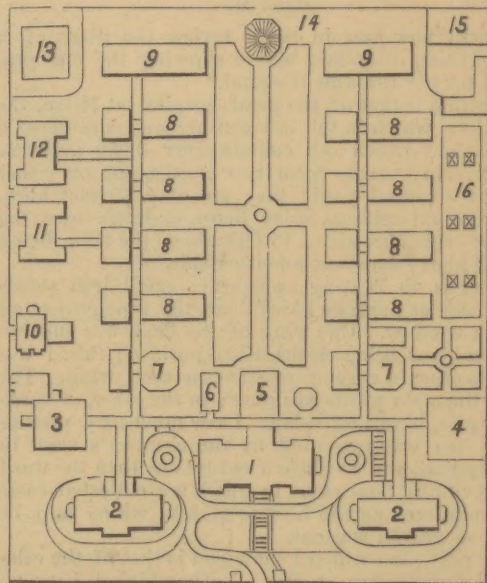
The next plan is that of two floors of the new pavilion recently erected in Chicago for the Cook County Hospital. This pavilion is four stories high, three of which are occupied by wards. It is heated by steam, and ventilated by a large aspirating shaft which passes up the centre of each ward. The heating has not proved satisfactory during the very cold days of the past winter, but it is said that this is due rather to bad management than to defect in the apparatus. The air in the lower wards is purer than in those above. The closet and bath rooms are, as usual, at the end of the ward remote from the connecting corridor, but are placed at one side, around a separate shaft which has independent aspirating power. On the other side is a small ward for isolating purposes, heated and ventilated mainly by a fire-place. This arrangement is taken from the plan which I first proposed for the Hopkins Hospital, and has some special advantages, particularly as regards the isolation of the patients in the small wards. The next plan is that of one of the wards of the Roosevelt Hospital in New York city, in which, by a peculiar arrangement, the service rooms at the remote end of the wards are so placed that they form no projection beyond the side of the ward itself.

The next plan is that of a floor of the new building now in course of construction by the authorities of the New York Hospital. This building is seven stories in height, will accommodate two hundred patients if crowded, and will cost about \$750,000. All the floors are tiled, and the only wood-work in the building is in the window-sash, doors, and door-frames. The heating is effected by steam, the ventilation by a fan for impulsion placed in the basement, and another fan for aspiration placed in the top of the centre building. The experiment is a bold one, and the results obtained, if carefully observed and accurately reported, cannot fail to be of interest.

The next plans are those of wards proposed for the Johns Hopkins Hospital. It has been considered by the building committee very desirable that the south end of all the wards should be entirely clear of service rooms, and be freely exposed for light and air, and these plans are arranged to carry out this idea. The one which is most generally preferred is that in which the ward is entirely separated from all service rooms, these last being collected in a building placed in the opposite side of the corridor. The majority of those whom I consulted, expressed doubts as to the advisability of removing all the service rooms to the north end of the ward, but admitted that if thorough ventilation and cleanliness could be preserved, the objections to it were rather theoretical than practical. A few critics insist that the nurse should have a separate room connected with the ward. This applies especially to the male wards in connection with the employment of female nurses, and is urged by some of those who are especially interested in this department. As I understand the duties of the female nurse, they are to be performed in the ward itself. I consider that to be her room, the absence of which is complained of, and while on duty, her place for rest is in the middle of it.

I now show you the block plan proposed for the hospital. The lot upon which it is to be placed has an area of about fourteen acres, and is situated on the side of a hill within the limits of the city. The buildings proposed consist of an administration building, and two wards for pay patients on the west, or main front, looking down towards the city: two octagonal wards of two stories each, eight one-story pavilion wards, two isolating wards, some tents; the nurses' home, the kitchen, the dispensary and operating

theatre, a mortuary building, an apothecaries' establishment, a bath-house, a laundry, a residence for the superintendent, a green-house and stables. The wards are arranged around a central garden, with the south ends projecting free. The operating theatre, dispensary, and mortuary building, are placed near the adjacent square upon which the medical school is to be situated. The wards, administration building, and kitchen, are connected by a corridor of the same height as that of the basements of the wards, namely, ten feet, so that the top of the corridor forms an open terrace walk, level with the floor of the wards.



BLOCK PLAN FOR PROPOSED JOHNS HOPKINS HOSPITAL.

EXPLANATION.—1. Administration Building; 2. Pay-Wards; 3. Kitchen; 4. Nurses' Home; 5. Dining-rooms for Medical Officers and Nurses; 6. Pharmacy; 7. Two-story wards; 8. One-story wards; 9. Isolating wards; 10. Residence of Superintendent; 11. Dispensary; 12. Operating Theatre; 13. Mortuary Building; 14. Green House; 15. Laundry; 16. Space for tents.

This plan is approved by the majority of experts to whom it has been submitted; but as you may easily infer from the widely different plans of some of the most recent hospitals both of this country and of Europe, which I have shown you, it cannot be said that the general principles of hospital construction are as yet settled on any scientific basis of observed facts, and I found, in fact, nearly as many opinions as persons,—“opinions often marked by all that decision and breadth of statement which distinguish those of persons unbewildered by the slightest experience.” I met with distinguished medical men and professors who object to the pavilion plan, who prefer wards with corridors at one side to those with opposite windows, who thought that there might be too much ventilation for a sick man, setting aside the question of draughts, and who spoke of a stuffy atmosphere as a good thing for certain cases. Some wished to concentrate the buildings as much as possible, but the majority prefer, when it can be done, to scatter and isolate them.

I have not time to show the plans of the general buildings, but I will call your attention to one, namely, that for the dispensary and the operating theatre.

I consider this dispensary for the treatment of the sick poor who remain at their own homes, as one of the most important features of this hospital, both on

account of the amount of suffering which may be relieved by it, and on account of the means of instruction for nurses and students which it affords. I therefore inquired particularly into the working of similar institutions abroad, and especially into that of the largest one, at St. Bartholomew's in London, where between 600 and 1,000 patients are seen and prescribed for daily. The plan before you is for two one-story buildings connected by a corridor. It is mainly through these and the mortuary building that I think the medical school should be connected with the hospital, and the general arrangements appear to me to be satisfactory for that purpose.

The responsibility of recommending one particular plan for this hospital, to the exclusion of all others, is very great. The whole subject of hospital construction is at present in a revolutionary condition. With almost every existing hospital there is more or less dissatisfaction, while from the most recent attempts to produce a perfect structure, the results are not yet known. I cannot learn how much healthier one-story wards are than those of two stories or more; the general opinion is, that they are better and more easily ventilated, that is all. It is objected by some that the buildings are spread over too much ground, and that it will be difficult to administer it, but the Frederichshain is still more scattered, and has greater distances, and yet seems to work very well.

In organizing the university, or the medical school, it is possible to proceed gradually and tentatively, getting the most important thing, namely the men, first, and leaving the buildings to be a gradual outgrowth of the necessities; but if anything like a permanent structure is proposed for the hospital, the plan of the buildings must, to a great extent at least, be first decided on, and this is peculiarly the case in the plan proposed, where it will be desirable that the foundations of all the buildings on the west front be laid before grading is commenced, in order to avoid excavations in newly deposited earth, which buildings are the largest and most costly of the establishment.

In recommending to the trustees that this general plan be adopted, I have been influenced by the following considerations:

1. Will the sick in the wards be placed in the best possible conditions as to light, pure air, warmth, etc., so that there shall be nothing in the surroundings to hinder their recovery? The answer to this is yes, and it may be considered as unanimous, for the advocates of other plans do not claim that their plans are better as regards the sick, but that they are as good.

2. So far as the medical department of the university is concerned, and as giving the necessary facilities for the education of physicians, and for advancing our knowledge of disease, are these plans satisfactory? The answer is yes, and is, I believe, unanimous.

3. So far as the training of nurses is concerned, are these plans suited to induce the class of women whom it is desired to secure—to enter and remain in this hospital? To this also, the answer is in the main affirmative, although doubts are expressed by some.

4. Are the plans practicable, and to be approved from the point of view of the architect and engineer? The answer is yes.

5. Can as good results be obtained by some other plan which shall cost much less in construction, or in administration, or in both; or if the results may perhaps be not quite so good, cannot relief be afforded to a greater number of people with the same expenditure? In other words, taking all things together, cannot the money be better employed in building a cheaper hospital, which shall also be more compact and

cheaper to manage, and which if not certainly as good in the hygienic, educational, or architectural point of view, will yet afford a sufficiently good care to a larger number of persons.

Upon this question there are great differences of opinion. Some hold that the expenditure upon the buildings of an hospital should never exceed \$1,000 per bed, and that the cost of administering it should never exceed \$1.00 per day, per patient, while others say that the best possible results should be aimed at regardless of the cost.

As I have above stated, I feel warranted in saying to the trustees that the plan submitted is, from the point of view of the physician, the hygienist, the architect, the educator, and the investigator, in all respects as good as, and in some better than, that of any hospital now in existence, or which has been proposed.

I must also say that, constructed as the architect proposes to construct it, it will be a solid and substantial group of buildings, and a comparatively costly one.

It will also be more expensive to manage than the great majority of hospitals of its size in existence, but it will accomplish more.

If I supposed that the number of sick poor in the city of Baltimore in urgent need of the aid of this charity was in excess of the number who can be provided for in this plan, I should advise such an amount of change and consolidation as would admit of doing the greatest good to the greatest number.

As I have no reason to think this, or that even 300 beds would not at the present time be sufficient to meet the demands upon this charity, I advise the adoption of the plan presented, but I recognize fully that this is not a medical, architectural, or scientific question, but one of finance, which belongs peculiarly to the trustees to determine, and their decision of which, whatever it may be, will be unsatisfactory to a certain number of persons. The question of cost in this case means, first, the time when the hospital shall be open to patients; second, the number to be cared for.

I base my recommendation upon the belief, that *in this particular case* it is best for the sake of the sick, of the school, and of suffering humanity throughout the world, to try to give to what patients we do receive, the very best possible facilities for treatment which modern science can suggest, and that the result cannot fail to be a valuable one.

I do not, and cannot say that the plan I have recommended is the best possible plan; but I believe it complies with the direction of the founder, that "it shall provide for an hospital which shall, in construction and arrangement, compare favorably with any other institution of like character in this country or in Europe."

Certainly I have seen nothing which I think superior, or in some respects equal to it; and if it has a medical, surgical, and nursing staff, and a superintendence of corresponding quality, I am quite sure that the results of treatment obtained in it will not be surpassed elsewhere.

In conclusion, permit me to express the hope that the physicians of Baltimore will not fail to take that interest in the plans for, and progress of, this hospital which is certainly due to the splendid possibilities which it presents for the promotion of the science and art of medicine.

Over in Washington, only an hour's ride away, there is open to all physicians a collection of medical literature unsurpassed in extent, variety, and value for practical work; while very soon in your own city you will have laboratories and hospital buildings as com-

pletely fitted for purposes of research and the promotion of increase of knowledge as any in the world.

But the books and buildings, machinery and apparatus thus provided, will not do the work. Remember the question asked by Professor Huxley, "What are you going to do with all these things?" Where shall we find the men who will make the best use of these opportunities; men who will not only teach the few students who may gather here, but all studious thinking medical men in all countries, because they will make known new signs, means of prevention, and methods of treatment of disease? Men who can impart to their pupils not only knowledge, but a thirst for knowledge, thus preparing worthy successors to themselves, and who will make the name of this city as well known in medical literature as were the names of Cos and Salernum of old.

These are problems the right solution of which is as important to the hospital as to the university. I commend them specially to your attention, and I hope and believe that at last satisfactory practical answers will be given; in which case there can be no doubt that in the fulness of time those results will be obtained which, both as physicians and as citizens, I am sure we all desire.

Original Communications.

NEEDLE IN LARYNX—REMOVAL BY EXTERNAL INCISION—RECOVERY.

By CHAUNCEY MITCHELL FIELD, A.M., M.D.,

OF BOUND BROOK, N. J.

PATIENT, Miss M. E. B., of Bloomington, N. J.; age twenty-five years; fine physical development. While dressing to attend an evening concert, and attempting to fasten a rosette on the bosom, the thread broke. Carelessly placing the needle between the lips she sought another thread, and while so engaged, on drawing a long breath, it slipped from its embrace, and lodged itself in the larynx.

The patient was immediately seized with violent coughing and choking, and in her extreme distress and suffering she rushed (seeking air) to the door and out of the house. In a short time the attack ceased, and she breathed freely for a few minutes, when again suddenly intense dyspnoea, with coughing and strangling, came on, the face becoming tumid and purple, and the patient nearly suffocated.

At 8 P.M. I saw the patient, within half an hour after the unfortunate accident. On my arrival I found her sitting in an arm-chair erect, holding the throat with her hands, greatly excited, breathing rapidly, not laboriously, and manifesting severe pain.

Quieting the nervous excitement by a few assuring words, the breathing became natural, simply marked by extremely cautious inspiration and expiration; continuous and repeated attempts at swallowing. When spoken to she answered plainly and distinctly, though she complained of pain at the time. There was no change whatever in the character of the voice.

On examining the throat I found a very slight prominence at the lower edge of the cricoid cartilage, and to the right (patient's) of median line, the patient placing her finger on the spot, and saying "she knew it was the needle," and complaining of pain on pressure of the spot.

I first tried the laryngoscope, but the excitability and irritability of the whole larynx made it useless.

On consultation with Dr. B. B. Matthews it was decided to attempt removal of the foreign body, or at least open the trachea. The patient having been anesthetized I made an incision three-quarters of an inch long in the median line over the cricoid cartilage. Coming down on the cartilage, and using this as a guide, I shoved the tissues aside with the handle of the scalpel until I arrived at the prominence indicating the *habitat* of the needle, the rays from a lamp furnishing certainly not the best light for such operation. Then, introducing finger and feeling the prominence, I determined to cut directly through it, hoping to come down exactly on the enemy. As I made the incision, steadying the trachea with the fingers of my left hand, the patient vomited, and then followed an attack of coughing and strangling until her face and neck were decidedly congested, and causing me to lose the locality of the trouble. This passed off in a very short space of time, and again finding the prominence I steadied the trachea with the left hand and incised the cartilage through its whole thickness; then passing a probe I hit the needle, and taking an ordinary dissecting forceps, after two abortive trials, on the third attempt I seized the needle by the head and succeeded in extracting it. Its position was across the larynx antero-posteriorly; head anterior, point sloping slightly upwards, backwards, and somewhat to the left of the median line, evidently piercing the posterior wall of the larynx. On its removal immediately every disagreeable symptom disappeared. The body is an ordinary sewing-needle, size number seven, and was black as they are found when removed from other parts of the body. The hemorrhage was very slight. The edges of the incision were brought together by means of adhesive plaster and united by first intention.

Patient has never had any disagreeable symptoms since, and made an excellent recovery.

On consulting Gross on "Foreign Bodies in the Air-Passages," I find the records of three cases of some interest in this connection.

First—The case of De La Mertiniere,* where a pin entered the trachea from outside through the integument. The patient (boy) had convulsions, and was breathing laboriously and scarcely living. On examining the trachea he felt, deep under the skin, *just below the cricoid cartilage*, a small circumscribed swelling the size of a lentil, and of unnatural hardness. Taking this as a guide he cut down as far as the trachea, where he came in contact with the foreign body projecting more than a line. After some difficulty he succeeded in extracting it with a pair of tweezers. The foreign body was a headless brass pin, fifteen lines in length, and had traversed the trachea from left to right and pierced its posterior wall.

The success of the operation was complete.

Next—A case by Mons. P. F. Blandin,† in which a man let a needle slip through the nose, together with a large thread, into the larynx. Much cough and irritation followed. Patient suffered remarkable hoarseness, dysphagia, and *almost entire aphonia*. (This may have been due to the swelling of parts, as record states that the larynx was much swollen, since in my case there was no change in the voice.) Laryngotomy was performed, the thyroid cartilage being divided in its whole length along the median line; still the needle was not extracted, but the next day was found in the dressings of the wound (19) nineteen lines in length, and of black color.

* P. 51, Gross on Foreign Bodies.

† Ibid., p. 297.